

Application No.: 10/618,761

Reply to the Office Action dated: December 9, 2004

AMENDMENT TO THE DRAWINGS

The attached sheet of drawings includes changes to the figure. This sheet, which includes the figure, replaces the original sheet including the figure.

Attachment: Replacement Sheet

BASIS FOR THE AMENDMENT

The specification has been amended to correct minor informalities.

Claim 2 has been canceled.

The claims have been amended for clarity.

New Claims 8-20 have been added.

New Claim 8 is supported at page 5, paragraph [0017].

New Claim 9 is supported at page 6, paragraph [0019].

New Claim 10 is supported at page 7, paragraph [0020].

New Claim 11 is supported at page 7, paragraph [0020].

New Claims 12 and 20 are supported at page 8, paragraph [0023].

New Claim 13 is supported at page 10, paragraph [0025].

New Claim 14 is supported at page 8, paragraph [0022] and at page 9, paragraph [0023].

New Claim 15 is supported at page 11, paragraph [0027].

New Claim 16 is supported at page 12, paragraph [0029].

New Claim 17 is supported at page 12, paragraph [0029].

New Claim 18 is supported at page 18, paragraph [0041].

New Claim 19 is supported at page 19, paragraph [0043].

The figure has been amended to correct minor informalities.

No new matter is believed to have been added by entry of this amendment. Entry and favorable reconsideration are respectfully requested.

Upon entry of this amendment Claims 1, 3-20 will now be active in this application.

REMARKS

Applicants respectfully request reconsideration of the application, as amended, in view of the following remarks.

The present invention as set forth in **amended Claim 1** relates to a polylactic acid composite material, comprising:

a polylactic acid;

a low molecular weight compound which has an amide group; and

a layered clay mineral that has been organically modified using an organic onium salt.

Topolkaraev et al (U.S. 6,451,895 B1), JP 10-081815 and JP 06299054 fail to disclose or suggest a composite material having in combination a low molecular weight compound having an amide group and a laminar clay mineral that has been organically modified using an organic onium salt.

Topolkaraev et al (U.S. 6,451,895 131) fail to disclose or suggest the low molecular weight compound having an amide group.

A comparison of Example 1 and **Comparative Example 2** in Table 1 at page 44 of the specification shows that a slow crystallization rate is achieved when only an organically modified layered clay mineral is added and **no low molecular weight compound**.

Table 1 is reproduced below:

Table 1

| INJECTION MOLDABILITY | MOLDING CONDITIONS | T ₁ [°C] T ₂ [°C] T ₃ [°C] | EXAMPLE 1 | EXAMPLE 2 | EXAMPLE 3 | EXAMPLE 4 | EXAMPLE 5 | COMPARATIVE EXAMPLE 1 | COMPARATIVE EXAMPLE 2 | COMPARATIVE EXAMPLE 3 | COMPARATIVE EXAMPLE 4 |
|---|-------------------------------|---|--------------|--------------|--------------|--------------|--------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | | | 74 | 78 | 78 | 76 | 78 | 90 | 80 | 76 | 88 |
| | MOLDING CONDITIONS 1 | T ₁ [°C] | 88 | 90 | 94 | 92 | 94 | 104 | 96 | 98 | 102 |
| | | T ₂ [°C] | 64 | 62 | 62 | 66 | 64 | 64 | 62 | 58 | 64 |
| | MOLDING CONDITIONS 2 | T ₁ [°C] | - | - | - | - | - | - | 90 | - | - |
| | | T ₂ [°C] | - | - | - | - | - | - | 76 | - | - |
| | | T ₃ [°C] | 114 | 110 | 116 | 116 | 112 | - | 72 | - | - |
| | | MOLDABILITY, MOLD RELEASE CHARACTERISTICS | A | A | A | A | A | C | B | C | C |
| HEAT DISTORTION TEMPERATURE [°C] | 1.80MPa | | 80.7 | 78.6 | 77.5 | 80.1 | 79.2 | - | 60.0 | - | - |
| | 0.45MPa | | 135.0 | 126.5 | 118.5 | 127.8 | 119.3 | - | 68.7 | - | - |
| DISPERSIBILITY | CRYSTALLIZATION RATE [min] | | A | A | B | B | B | - | A | - | - |
| | | | 1.87 | 1.85 | 1.92 | 1.89 | 1.95 | - | 2.43 | 2.40 | 2.68 |
| | HEAT OF CRYSTALLIZATION [J/g] | | 29.0 | 31.0 | 28.8 | 30.3 | 28.5 | - | 25.3 | 25.8 | 24.8 |

JP '815 and JP '054 fail to disclosure or suggest a laminar clay mineral that has been organically modified using an organic onium salt.

JP '815 only discloses a technique to improve anti-blocking property of film by addition of amide compound. JP '054 only discloses a technique to prevent welding of pellets at the feed throat of pellets in the molding machine by addition of amide compound. Topolkaraev et al relates to the improvement of flowability and not the improvement of crystallinity and mold release characteristics as the present invention (see paragraph [0008] of the specification). Thus, there is no disclosure in these references that the rate of crystallization can be influenced by the addition of a low molecular weight compound to polylactic acid and an organically modified layer clay mineral.

As seen from above **Comparative Example 3**, the crystallization rate is inferior when only the low molecular weight compound is added to the polylactic acid.

Superior results are obtained when using a combination of the claimed low molecular weight compound and the organically modified layered clay material as discussed in paragraphs [0008] and [0021] and shown in the Examples of the specification.

The specification discloses at paragraph [0008]:

... the present inventors discovered that in cases where both a low molecular weight compound that has an amide group and a layered clay mineral that has been organically modified using an organic onium salt are added to a polylactic acid, the crystallization rate is greatly increased compared to a case in which only the abovementioned low molecular weight compound or layered clay mineral is added. This discovery led to the perfection of the polylactic acid composite material of the present invention, which is superior in terms of heat resistance, moldability and mold release properties.

Further, paragraph [0021] discloses:

In the present invention, a low molecular weight compound that has an amide group and a layered clay mineral that has been organically modified by means of an organic onium salt are dispersed in the abovementioned polylactic acid. As a result, a synergistic effect in the production of polylactic acid crystal nuclei and the promotion

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of crystal growth is obtained, so that the crystallization rate of the polylactic acid can be sufficiently increased.

The Examples provide in Table 2 data showing the superior heat resistance, moldability and mold release characteristics of the composite material according to the present invention (Examples 6-9). Notably, Comparative Example 5 does not contain a low molecular weight compound, or an organically modified layered clay material; Comparative Example 6 does not contain an organically modified layered clay material. See for Example Table 2 at page 52 of the specification which has been reproduced below:

Table 2

| MOLDING CONDITIONS | MOLD TEMPERATURE 40°C, COOLING TIME 60 SECONDS | MOLD TEMPERATURE 80°C, COOLING TIME 120 SECONDS | MOLD TEMPERATURE 100°C, COOLING TIME 120 SECONDS |
|--------------------------|--|--|--|
| OBJECT OF EVALUATION | DEGREE OF DEFORMATION DURING ANNEALING TREATMENT | MOLDABILITY | HEAT DISTORTION TEMPERATURE (°C AT 1.80 MPa) |
| EXAMPLE 6 | A | A | 68 |
| EXAMPLE 7 | A | A | 70 |
| EXAMPLE 8 | A | A | 68 |
| EXAMPLE 9 | A | A | 67 |
| COMPARATIVE EXAMPLE 5 | C | C | - |
| COMPARATIVE EXAMPLE 6 | B | B | 63 |

In the present invention, ...the crystallization rate of the polylactic acid is sufficiently increased by the synergistic effect of a low molecular weight compound having an amide group and a layered clay mineral that is organically modified by an organic onium salt so that heat resistance and moldability and mold release characteristics during the manufacture of a molded body can be achieved at a high level.

See paragraph [0159], and Table 2 at page 52.

Therefore, the rejection of Claims 1-7 under 35 U.S.C. § 103(a) as being unpatentable over Topolkaraev et al (U.S. 6,451,895 B1) in view of JP 10-081815 or JP 06299054 is believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of this rejection is respectfully requested.

The rejection of Claims 1-7 under 35 U.S.C. § 112, second paragraph, is obviated by the amendment of Claim 7.

The rejection of Claims 1-7 under 35 U.S.C. § 112, second paragraph, is traversed with regard to the "low molecular weight compound" in Claims 1 and 3.

The specification discloses in paragraphs [0022] to [0024] of the specification various examples of a "low molecular weight compound." Thus, in view of the specification, it is clear what is meant by "low molecular weight compound." Thus, this rejection should be withdrawn.

The rejection of Claim 2 is moot in view of the cancellation of Claim 2.

In regard to the Examiner's request to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made, Applicants' Representative is confirming with the Applicants that all claims were and are commonly owned. Applicants' Representative will update the Examiner in the event that the claims are not commonly owned.

This application presents allowable subject matter, and the Examiner is kindly requested to pass it to issue. Should the Examiner have any questions regarding the claims or

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otherwise wish to discuss this case, he is kindly invited to contact Applicants' below-signed representative, who would be happy to provide any assistance deemed necessary in speeding this application to allowance.

Respectfully submitted,

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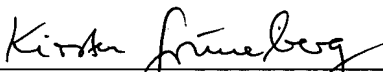
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